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MARE ISLAND
SSIC NO. 5090.3.A

DEPARTMENT OF THE NAVY
MARE ISLAND NAVAL SHIPYARD
VALLEJO, CALIFORNIA 94592

Ser 461/49
APR 1 1 1986

California Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Oakland, CA 94607
Attention: Ms. Lila Tang

Dear Ms. Tang:

As requested in our meeting of 31 March 1986 regarding Cleanup and Abatement Order No. 85-019, a proposed hydrogeologic investigation work plan, enclosure (1), is provided for the waste management area which includes the Mare Island Sanitary Landfill. Efforts are in progress to contract the work as indicated. Please comment on any proposed action which does not appear to conform with current requirements.

In accordance with the proceedings of the 31 March meeting, the enclosed plan reflects the following changes and clarifications of previous requirements:

a. In-situ permeability calculations will be accomplished through slug tests and packer type tests because pumping tests do not appear to be practical for the observed soils.

b. Monitoring of tidal influence will be accomplished at Wells 1S, 3S, 3D, 5S, and 5D.

c. Barometric considerations will be accomplished by relating local barometric data to continuous water level monitoring.

Also in accordance with the 31 March meeting, a follow-up meeting will be conducted at the Board offices on 30 April 1986 at 1000 to evaluate Shipyard progress.

The primary Shipyard point of contact in this matter is Code 461, Mr. Ralph Lee, at telephone (707) 646-2421 or 2432.

Sincerely,

H.R. Frauenfelder

H.R. FRAUENFELDER
Captain, CEC, USN
Public Works Officer
By direction of the Shipyard Commander

Enclosure:
(1) Aqua Terra Technologies' Proposal of 3 April 1986, Hydrogeologic Investigation Work Plan, RWQCB Cleanup and Abatement Order No. 85-019

5090
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Copy to:
United States Environmental Protection Agency
Region IX
Toxic and Waste Management Division, Code M-5
Attention: Mr. Mark Kamiya
215 Fremont Street
San Francisco, CA 94105

California Water Resources Control Board
Division of Water Quality
Attention: Mr. Dennis Parfitt
901 P Street
Sacramento, CA 95814

California Department of Health Services
Toxic Substances Control Division
Attention: Mr. Andrew Hicks and Mr. Alan Lui
5850 Shellmond Road, Room 317
Emeryville, CA 94608

Naval Energy and Environmental Support Activity, Code 112N
Attention: Mr. Steve Eickenberry
Port Hueneme, CA 93041-5014

Western Division, Naval Facilities Engineering Command, Code 1142
Attention: Mr. Richard Seraydarian
P.O. Box 727
San Bruno, CA 94066

Aqua Terra Technologies
3490 Buskirk Avenue, Suite A
Pleasant Hill, CA 94523

April 3, 1986

AQUA TERRA Technologies

Mr. Ralph M. Lee, P.E.
Environmental Engineer
Mare Island Naval Shipyard
Public Works Department
Code 445, Stop Ø32
Vallejo, CA 94592

Subject: Hydrogeologic Investigation Work Plan
RWQCB Clean-up & Abatement Order No. 85-Ø19

Dear Mr. Lee:

As required under Clean-up and Abatement Order No. 85-Ø19, issued by the San Francisco Bay Regional Water Quality Control Board (RWQCB) on September 18, 1985, and according to subsequent correspondence and discussions among Mare Island Naval Shipyard (MINSY), Aqua Terra, and RWQCB personnel, this letter presents a work plan and schedule for conducting a hydrogeologic investigation in the vicinity of the MINSY Sanitary Landfill. The hydrogeologic investigation will be performed by Aqua Terra in accordance with Contract N62474-85-C-Ø221.

Currently, we believe the hydrogeologic evaluation can be completed in three phases. Phase I, which involved preliminary field evaluations and summarization of existing data, was completed during the period from February 28 to March 31, 1986. The results of the Phase I work were discussed with the RWQCB at a meeting on March 31, 1986. Phase I work specifically included:

- Review and summary of existing relevant documents inluding geotechnical reports, soil boring logs, Initial Assessment Study report, groundwater monitoring data, and aerial photographs. Previous contractors were contacted to obtain information regarding their relevant field activities at MINSY. The review and summary resulted in the preparation of an accurate base map showing existing well locations, the preparation of geologic profiles, definition of current and historic landfill boundaries, documentation of the historic development of the landfill area, and identification of surface physical features which may influence landfill monitoring. Additionally, groundwater sample chemical data were reviewed.

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Aqua Terra Technologies / Environmental Consultants

- Preliminary field investigations which included pumping Kleinfelder wells to assess suitability for sampling, conducting a limited test boring program which included collection of continuous soil cores and installation of piezometers, and weekly groundwater level measurements at existing wells.

Phase II work is described in detail herein. This work will include detailed field investigation to define soil and hydraulic characteristics, and to assess tidal and barometric influences on groundwater levels. At the completion of Phase II, a detailed plan for Phase III work will be prepared. It is anticipated that Phase III work will involve the final implementation of an appropriate monitoring program for the MINSY landfill. The Phase II work plan presented below was developed in conjunction with RWQCB and State Water Resource Control Board (SWRCB) staff at our meeting on March 31, 1986. The progress of the Phase II work will be reviewed with RWQCB and SWRCB staff at regular progress meetings to be scheduled during the last week of April and the last week of May, 1986.

PROPOSED PHASE II WORK PLAN

The Phase II hydrogeologic investigation will be performed by the tasks described below. A summary of field sampling protocol is attached.

Task 1 - Soil Sampling

Test borings will be drilled near the landfill area to further characterize subsurface conditions. Seven test borings (about 40 feet deep) and approximately 20 shallow test borings (about 15 feet deep) will be drilled around the perimeter of the landfill. All test borings will be continuously sampled. Upon completion of drilling, the borings will be backfilled with a cement/bentonite grout.

All samples will be extruded from sample liners and classified according to the Unified Soil Classification System. Detailed test boring logs which record the results of the exploration program will be prepared.

The shallow test borings will be used to define the distribution and characteristics of the fill materials blanketing the area adjacent to the landfill. The location of many of

the shallow test borings will be selected in the field by our engineering geologist. The locations will depend significantly upon the site conditions encountered at the time of drilling.

Task 2 - Soil Testing

Laboratory tests will be performed on selected, undisturbed samples of the materials recovered from the test borings. The testing program will be designed to characterize/classify the hydraulic characteristics of the soils encountered. The testing program will likely consist of grain size distribution, percent passing a No. 200 sieve (0.074 mm), hydrometer, Atterberg limits, and permeability tests.

Task 3 - Tidal Evaluations

The influence of tidal fluctuations on groundwater levels will be evaluated by continuously monitoring groundwater levels in several existing wells. Well 1S, 3S, 3D, 5S, and 5D will be monitored. Additionally, water levels in the two piezometers which were installed within the closed section of the landfill will be monitored. Wells 1S, 3S, and 5S are shallow wells, approximately 10 feet deep, which are primarily screened within fill. Wells 3D and 5D extend about 38 feet below the surface and are screened entirely within naturally deposited Bay Mud. By monitoring these wells, tidal influences within both shallow and comparatively deep stratigraphic units will be evaluated. Tidal variations will be assumed to be consistent with published tide charts for MINSY.

Groundwater levels in the wells will be continuously monitored using pressure transducers installed in the wells. The transducers will be connected to a recording device so that a continuous record of water level in the wells is obtained. The test will be conducted over a period of at least seven days. If possible, the testing period will be selected so that it coincides with maximum low and high tides. An attempt will be made to monitor groundwater wells during a period of relatively stable barometric pressure. Barometric data recorded at the MINSY weather station will be reviewed in conjunction with an evaluation of the water level data collected for tidal influences.

Task 4 - Hydrogeologic Evaluations

It is appropriate to characterize the hydrogeologic

characteristics of the fills blanketing the landfill area and the underlying Bay Mud; however, because the fill in the area is highly heterogeneous, it would be most appropriate to complete the study to evaluate the fill after subsurface conditions are better understood. Therefore, specific scope of evaluations to hydrogeologically characterize the fill will be developed and submitted to MINSY for transmittal to the RWQCB for review following completion of Tasks 1 and 2. Studies will be implemented initially to evaluate the hydraulic characteristics of the Bay Mud.

The hydrogeologic characteristics of soils in the landfill area will be evaluated by conducting in-situ permeability tests. The permeability tests will provide an estimate of the average permeability of the soil corresponding to the screened interval in each well tested. The permeability tests will include slug tests in the relatively impermeable Bay Mud, and packer type tests in fill materials.

Slug tests will be performed at four separate locations using existing Wells 2D, 3D, 5D, and 6D. The tests will be conducted by evacuating the wells and accurately monitoring the rate at which water levels recover. Groundwater level recovery will be monitored using a pressure transducer system with electronic recording.

The packer type tests will be conducted in existing Wells 1S, 2S, 3S, 4S, 5S, and 6S. Clean, de-ionized water will be used for the packer tests, with pressure and flow rate monitored and recorded. Of the shallow bore holes described under Task 1, one each will be placed in the vicinity of each of the shallow Kleinfelder wells to enable more accurate interpretation of the packer type test data.

All downhole testing equipment will be steam cleaned prior to placement in each well.

Groundwater levels in the 12 ISD wells and the 10 Kleinfelder wells will continue to be monitored on a weekly basis, and all wells placed during the investigation outlined herein will also be monitored weekly to assess seasonal variations.

Task 5 - Report Preparation

Upon completion of the Phase II work described herein, Aqua Terra will prepare a report for submittal to the RWQCB following review and approval of MINSY. The report will

include complete logs of the soil borings, well construction details and a plan showing well and soil boring locations, a detailed description of field procedures, and geologic data and its interpretation. Multiple cross sections depicting subsurface geology will be developed based on the test boring data. Groundwater level measurement and well elevation survey data will be summarized. Well development logs and hydrogeologic test data will be attached to the report.

SCHEDULE

It is our intent to complete Tasks 1 through 4 as described herein for the Phase II work plan within 60 days from the date of our receiving written approval of the plan from the RWQCB and our receiving contract authorization from MINSY. The report described in Task 5 will require an additional 15 days beyond the 60 days to complete. This schedule assumes no other events beyond our control impede the work progress. Additionally, we plan to continue meeting with RWQCB staff at approximately 30 day intervals to discuss work progress.

A proposed work plan to complete the hydrogeologic study and implement an appropriate monitoring system for the MINSY landfill will be transmitted with the Phase II report.

If you have any questions regarding the contents of this letter, please contact me.

Sincerely,

Aqua Terra Technologies, Inc.

R. Wane Schneiter

R. Wane Schneiter, Ph.D., P.E.
Project Manager

RWS:lg
Attachment

Attachment to Phase II Work Plan
Mare Island Naval Shipyard
April 3, 1986

PROTOCOL

SOIL & GROUNDWATER INVESTIGATIONS
SAMPLE COLLECTION & HANDLING

All borings for sample collection and well installation will be drilled under the supervision of our engineering geologist who will obtain undisturbed samples of the soils encountered and prepare detailed logs of each boring.

All borings for exploration and well installation purposes will be drilled using eight-inch diameter hollow stem auger equipment or rotary wash drilling equipment. Our engineer will direct the collection of undisturbed samples of the soils encountered and the preparation of detailed logs of each boring. A continuous core of the materials encountered will be obtained at each boring location. The cores will be retained in 2.25-inch diameter clear acrylic tubes, each about 2.5 feet long, or where stiff or dense soils are encountered, in 2.5-inch diameter brass sample liners, about six inches long. The samples will be capped and carefully logged in our laboratory.

At all well locations, the soil sampler, sample tubes, augers, and casing and screens will be steam cleaned prior to their initial use. The sampler and augers will be steam cleaned between each subsequent use to reduce the likelihood of cross contamination between samples and/or test borings.

Monitoring wells will consist of two or four-inch diameter, Schedule 40 PVC casing and screens with flush, threaded joints. No PVC glue will be used. The screened sections will be machine slotted with 0.020-inch (0.51 mm) slots. The 0.020-inch slot was selected to retain 100 percent of the filter material. The annular space surrounding the well screen will be packed with Lonestar No. 3 washed sand filter material. The gradation of the filter material is summarized below:

U.S. Sieve	Opening (mm)	Percent Passing
8	2.36	99 - 100
12	1.70	62 - 78
16	1.18	15 - 33
20	0.85	0 - 8
30	0.60	0 - 4

For wells, a seal of bentonite pellets approximately one-foot thick will be placed above the sand pack to reduce the risk of grout penetration into the sand. The annulus around the solid section of the well casing will be sealed with a thick cement/bentonite grout which will extend from the top of the bentonite pellets to the groundsurface. The grout will be pumped into the bore holes using a tremmie pipe.

Each well head, terminated above or below grade, will be placed within a secured enclosure and fitted with a locking cap. Well head elevations will be determined by a level survey, and well locations will be determined by taping distances from permanent landmarks. The level survey will be referenced to a bench mark of known elevation.

After the wells have been completed, they will be developed by pumping to clean and stabilize the soils around the screens. A dual hose airlift pumping system will be used for development. We anticipate removing a minimum of 10 well casing volumes of water during development. All development equipment will be steam cleaned prior to its initial use in each well. A well development log will be maintained which will include 1) a record of development water turbidity in NTUs at frequent intervals, 2) the quantity of water removed during development, and 3) flow rates during development.